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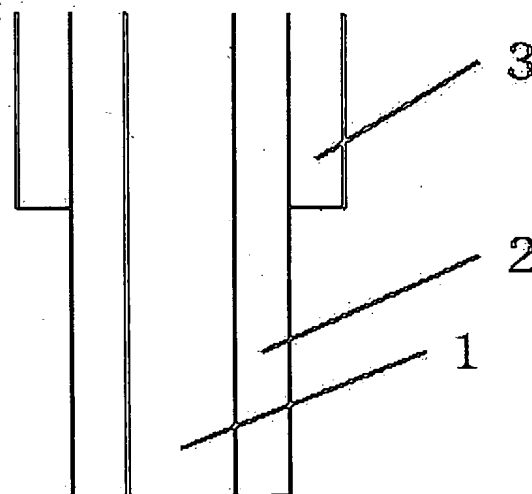
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(54) OPTICAL FIBER, DENTAL LASER TREATMENT DEVICE ATTACHING IT, AND METHOD FOR MANUFACTURING AND USING ITS DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a dental laser treatment device and methods for manufacturing and using its device which are suitable for preventing and treating dental diseases such as a periodontal disease and a chronic progressive marginal periodontitis.  
 SOLUTION: An optical fiber which is attached to the dental treatment device is provided with a concentric circular structure and is composed of at least a core becoming the center, a clad coating the outside of the core and further a protective layer coating the outside of the clad. The clad is exposed at the tip end part of the optical fiber, and a titanium compound is attached to the tip end part. The dental laser treatment device is provided with a light source for exiting laser beams and a light guide part for irradiating a part to be treated by the laser beams, and at least the laser beam radiating part at the tip end part of the light guide part is formed of the above optical fiber.



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CLAIMS

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## [Claim(s)]

[Claim 1] It is the laser surgery equipment attaching optical fiber for dentistry in which consist of clad which covered nothing, the core which takes the lead at least, and its outside for concentric circle-like structure, and a protective layer which covered the outside of clad further, and the amount of point is an optical fiber which clad has exposed, and the amount of the point comes to adhere to a titanium compound.

[Claim 2] The optical fiber according to claim 1 whose optical fiber is a quartz system fiber.

[Claim 3] A titanium compound is the optical fiber for a point of an optical fiber according to claim 1 or 2 to which the clad section comes to adhere at least.

[Claim 4] An optical fiber given in the claim 1 whose titanium compound is titanium oxide, or any 1 term of 3.

[Claim 5] It has a light guide section for making the light source and the laser beam which carry out outgoing radiation of the laser beam irradiate the treated section. It is laser surgery equipment for dentistry of this light guide section with which the laser beam radiant section for a point was formed by the optical fiber at least. The aforementioned optical fiber consists of clad which covered nothing, the core which takes the lead at least, and its outside for concentric circle-like structure, and a protective layer to which the outside of clad was covered further. A part for the point is laser surgery equipment for dentistry with which clad is exposed with equipment and the amount of the point comes to adhere to a titanium compound and which is an optical fiber.

[Claim 6] Laser surgery equipment for dentistry according to claim 5 with which it is characterized by being based on a means to emit a laser beam after adhesion of a titanium compound makes the amount of [ of an optical fiber ] point contact titanium oxide powder.

[Claim 7] It has a light guide section for making the light source and the laser beam which carry out outgoing radiation of the laser beam irradiate the treated section. The laser surgery equipment for dentistry of this light guide section with which the laser beam radiant section for a point was formed by the optical fiber at least, Laser surgery equipment for dentistry which made the back laser beam which made the amount of [ of the optical fiber ] point contact titanium oxide powder emit, and the titanium compound was made to adhere to a part for the point of an optical fiber, and was obtained after removing the protective layer for a point of the aforementioned optical fiber and exposing clad.

[Claim 8] Laser surgery equipment for dentistry given in the claim 5 whose optical fiber is a quartz system fiber, or any 1 term of 7.

[Claim 9] Laser surgery equipment for dentistry with a titanium compound given in the claim 5 for a point of an optical fiber to which the clad section comes to adhere at least, or any 1 term of 8.

[Claim 10] Laser surgery equipment for dentistry given in the claim 5 whose titanium

compound is titanium oxide, or any 1 term of 9.

[Claim 11] Laser surgery equipment for dentistry given in the claim 5 characterized by preparing the aforementioned laser beam radiant section free [ attachment and detachment. ] to the aforementioned light guide section, or any 1 term of 10.

[Claim 12] It has a light guide section for making the light source and the laser beam which carry out outgoing radiation of the laser beam irradiate the treated section. The laser surgery equipment for dentistry of this light guide section with which the laser beam radiant section for a point was formed by the optical fiber at least, After removing the protective layer for a point of the aforementioned optical fiber and exposing clad, The manufacture method of the laser surgery equipment for dentistry characterized by taking means to make the back laser beam which made the amount of [ of the optical fiber ] point contact titanium oxide powder emit, and to make a titanium compound adhere to a part for the point of an optical fiber.

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DETAILED DESCRIPTION

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## [Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the suitable laser surgery equipment for dentistry for prevention and treatment of the dentistry-illness, such as gum disease and periodontoclasia. It is related with the laser surgery equipment for dentistry which attached in more detail the optical fiber in which the amount of point adhered to the titanium compound.

[0002]

[Description of the Prior Art] The gum is invaded owing to the bacteria which accumulated in \*\*\*\*\*, inflammation occurs, inflammation progresses to the deep part of a dental surrounding organization further, and gum disease and periodontoclasia can come to do a crevice called the periodontal pocket. Although a laser beam is irradiated at the tooth affected part, treatment in the oral cavities, such as incision, hemostasis, and resolution, is performed or removal of prevention of cariosity, and a dental calculus and a dental plaque is performed in recent years, as medical-application laser equipment used for this, the equipment which prepared the laser beam generating section in the irradiation probe body is used.

[0003] However, application of the laser beam to the conventional dentistry is used for taking a measure surgically [ the inflammation section of the gum invaded bacteria, or the periodontal pocket ] rather than the treatment to gum disease, periodontoclasia, etc., as described above.

[0004] On the other hand as technology which applied titanium oxide to the treatment for dentistry By arranging or covering photocatalyst matter, such as a titanium dioxide which has oxidizing power by receiving irradiation of light, so that it may contact to a tooth The dental plaque which caused cariosity and a periodontal disease is made to decompose, specifically, a titanium dioxide is made powdered and technology in which an application etc. covers to a tooth by carrying out the technology which prevents these disorders, and the liquefied object with which it mixed with the rubber system macromolecule resin etc. at the time of use is \*\*\*\*\* (ed). The phosphor is mentioned as a photogene. (JP, 9-175923, A)

[0005] Moreover, a visible ray is irradiated suitably at the hardening object containing metal support titania fines, this hardening object and a circumference tooth part are sterilized, and the technology of aiming at prevention of cariosity or a periodontal disease and bad smell prevention is indicated. (JP, 5-32516, A)

[0006] Such technology is also prevention technology, such as gum disease, and is far from the treatment to gum disease, periodontoclasia, etc.

[0007]

[Problem(s) to be Solved by the Invention] this invention was made in view of the above-mentioned situation, and the purpose is in offering the suitable laser surgery equipment for dentistry for prevention and treatment of the dentistry-illness, such as gum disease and periodontoclasia.

[0008]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, as a result of inquiring wholeheartedly, the equipment which attached titanium oxide to a part for the optical-fiber point of laser equipment by the laser beam could treat gum disease dramatically, and this invention persons find out that the above-mentioned technical problem is solved, and came to complete this invention.

[0009] That is, this invention consists of clad which covered nothing, the core which takes the lead at least, and its outside for concentric circle-like structure, and a protective layer which covered the outside of clad further, it is the optical fiber which clad has exposed and the amount of point is a laser surgery equipment attaching optical fiber for dentistry in which the amount of the point comes to adhere to a titanium compound.

[0010] Moreover, this invention has a light guide section for making the light source and the laser beam which carry out outgoing radiation of the laser beam irradiate the treated section. It is laser surgery equipment for dentistry of this light guide section with which the laser beam radiant section for a point was formed by the optical fiber at least. The aforementioned optical fiber consists of clad which covered nothing, the core which takes the lead at least, and its outside for concentric circle-like structure, and a protective layer to which the outside of clad was covered further. The amount of the point is laser surgery equipment for dentistry with which clad is exposed with equipment and the amount of the point comes to adhere to a titanium compound and which is an optical fiber.

[0011] Moreover, this invention has a light guide section for making the light source and the laser beam which carry out outgoing radiation of the laser beam irradiate the treated section. The laser surgery equipment for dentistry of this light guide section with which the laser beam radiant section for a point was formed by the optical fiber at least, After removing the protective layer for a point of the aforementioned optical fiber and exposing clad, it is laser surgery equipment for dentistry which made the back laser beam which made the amount of [ of the optical fiber ] point contact titanium oxide powder emit, and the titanium compound was made to adhere to a part for the point of an optical fiber, and was obtained.

[0012] Moreover, this invention has a light guide section for making the light source and the laser beam which carry out outgoing radiation of the laser beam irradiate the treated section. The laser surgery equipment for dentistry of this light guide section with which the laser beam radiant section for a point was formed by the optical fiber at least, After removing the protective layer for a point of the aforementioned optical fiber and exposing clad, It is the manufacture method of the laser surgery equipment for dentistry characterized by taking means to make the back laser beam which made the amount of [ of the optical fiber ] point contact titanium oxide powder emit, and to make a titanium compound adhere to a part for the point of an optical fiber.

[0013] Moreover, this invention has a light guide section for making the light source and the laser beam which carry out outgoing radiation of the laser beam irradiate the treated section. The laser surgery equipment for dentistry of this light guide section with which the laser beam radiant section for a point was formed by the optical fiber at least, After removing the protective layer for a point of the aforementioned optical fiber and exposing clad, It is the operation of the laser surgery equipment for dentistry characterized by taking means to make the back laser beam which made the amount of [ of the optical fiber ] point contact titanium oxide powder emit, and to make a titanium compound adhere to a part for the point of an optical fiber.

[0014] The optical fiber used by this invention can be a quartz system fiber.

[0015] Moreover, the thing for the point of an optical fiber which the clad section adheres to the titanium compound at least is desirable. After adhesion of a titanium compound makes the amount of [ of an optical fiber ] point contact titanium oxide powder, being based on a means to emit a laser beam is desirable. Furthermore, the titanium

compound of this invention can be titanium oxide.

[0016] Moreover, although the aforementioned light guide section and one are sufficient as the aforementioned laser beam radiant section, it is functional to take the structure established free [ attachment and detachment ] to the aforementioned light guide section, and it is desirable.

[0017] When the amount of [ of an optical fiber ] point is made to contact titanium oxide powder and a laser beam is emitted in the therapeutic device of this invention, a laser beam contacts the titanium oxide to which clad adhered through the crack section of the clad destroyed with intense energy, a reaction is made to cause, and the matter produced by it is considered to have played the big role to treatment at least. the titanium compound produced by the reaction -- at least -- low -- the titanium oxide containing degree titanium oxide is seemed

[0018]

[Embodiments of the Invention] Hereafter, the operation gestalt of this invention is explained in full detail.

[0019] The structure which is to the foundations of the laser surgery equipment for dentistry of this invention has a light guide section for making the light source and the laser beam which carry out outgoing radiation of the laser beam irradiate the treated section, and is formed by the special optical fiber of this light guide section which the laser beam radiant section for a point mentions later at least. As for the control means used for the laser surgery equipment for dentistry of this invention, it is desirable to form interception and release of turning on and off of this light source and the light guide section from the light source to a laser beam radiant section, the timer for setting up irradiation time, and a switch. It uses in this invention, being able to convert the commercial laser surgery equipment for dentistry. As commercial equipment, "the KONTAKKU lathe (CONTACTLASE; registered trademark)" (made in incorporated company id ERU tee Japan) is mentioned.

[0020] Nd-YAG laser is desirable, although especially the light source used for the laser surgery equipment for dentistry of this invention is not limited, anythings, such as light laser and an infrared laser, can use it, for example, Nd-YAG laser, ruby laser, Nd-glass laser, LD-YAG laser, Er-YAG laser, etc. are mentioned.

[0021] The light guide section used for the laser surgery equipment for dentistry of this invention draws light to the laser beam radiant section which prepared the light from the light source in a part for the point of a light guide section, and even if there are few the laser beam radiant sections, a part for a point is formed by the optical fiber. The optical fiber consists of clad which covered nothing, the core which takes the lead at least, and its outside for concentric circle-like structure, and a protective layer which covered the outside of clad further. And as shown in drawing 1, the protective layer was removed and clad has exposed a part for the point of an optical fiber to a front face.

[0022] As an optical fiber used by this invention, the optical fiber of a quartz system is desirable. The fluoride glass fiber of a zirconium system etc. is mentioned to others.

[0023] Although especially the size of an optical fiber is not limited, a thing with a diameter of 1.5mm or less is used preferably. It is a thing 1.0mm or less still more preferably.

[0024] Although it is not limited, when considering contacting a light guide section to the parodontal pocket which is the affected part \*\*\*\*ing, for example using the handpiece, as for especially the length of an optical fiber, projecting 5mm or more is more desirable than a handpiece nose of cam.

[0025] It is better for workability to carry out the curvature of the laser beam radiant section, although the configuration of an optical fiber may be straight.

[0026] The amount of the point is [ making attachment and detachment free so that it may enable it for fiber cutters, such as a sapphire knife, to cut easily or can remove ] good

\*\*\*\* with desirable [ the optical fiber of the laser beam radiant section of this invention ] after treatment therefore it being throwing away on sanitation, since saliva etc. is attached. The means by which these meanses are conventionally well-known is used.

[0027] A protective layer is removed and, as for a part for the point of the optical fiber prepared in the laser beam radiant section of the laser surgery equipment for dentistry of this invention, clad is exposed to the front face. The amount of [ of the optical fiber ] point adheres to the titanium compound. The thing of an optical fiber which the clad section adheres to the titanium compound at least is required. removal of a protective layer -- fire, such as a writer, -- burning off -- \*\* -- it is efficient and is desirable on operation

[0028] After exposing the clad for a point of the optical fiber of the laser beam radiant section of the laser surgery equipment for dentistry which makes a part for a point at least by removing a protective layer and the method of adhering a titanium compound to a part for the point of an optical fiber contacts this portion to titanium oxide powder, its method of making a laser beam emit is simple, and it is the most effective. [ of a method ] If a titanium compound is made to adhere to a part for the point of an optical fiber by such method, the laser surgery equipment for dentistry of this invention will be obtained. A rutile type or an anatase type is sufficient as the titanium oxide used. 10 micrometers or less of mean particle diameters of titanium oxide are 5 micrometers or less still more preferably.

[0029] It is desirable to face [ treating using the equipment of this invention and ] and to make a titanium compound adhere during treatment operation at a part for the point of an optical fiber. That is, after exposing the clad for a point of the optical fiber of the aforementioned laser beam radiant section which makes a part for a point at least by removing a protective layer and contacting this portion to titanium oxide powder, a laser beam is made to emit and a titanium compound is made to adhere. Subsequently, a laser beam radiant section is inserted into the oral cavity, and after contacting an optical-fiber nose of cam to the affected part or making it approach to \*\*\*\*, a direct laser beam is emitted towards the affected part. In the case of gum disease, it treats by inserting an optical-fiber nose of cam in the periodontal pocket directly.

[0030]

[Example] An example is given below and this invention is explained still more concretely.

(Example 1) the commercial laser surgery equipment for dentistry "the KONTAKKU lathe (CONTRACTASE; registered trademark)" (made in incorporated company id ERU tee Japan) (a light source Nd-YAG laser (wavelength of 1.06 micrometers) --) After burning off the protective layer for the optical-fiber point attached to the light guide section of this equipment for the fire of a writer using the optical fiber of a quartz and exposing clad, a part for the point of this optical fiber was made to insert in the powder layer in 25ml bottle containing titanium oxide powder. Subsequently, the laser beam was emitted by the power of 500mJ and 10pps, and a part for a point was processed with titanium oxide. In addition, it is checking that titanium compounds, such as titanium oxide, have adhered to a part for the point of an optical fiber separately with the phase-contrast microscope. When a measure was taken emitting a laser beam to the affected part of the patient A who worries about gum disease using this equipment, pus stopped, the mobility of teeth which is shaking was lost, and it recovered. Then, there is no relapse and Mr. A is not afflicted by many symptoms concerning gum disease.

[0031] (Example 2) A measure was taken to the patient B who worries about gum disease like an example 1. When a measure was taken by 1 time of frequency at about two weeks, 30 days after finishing the 3rd treatment, it became swollen and the ache also disappeared, pus also stopped, and the mobility of teeth of it which is shaking was lost, and it acted as Kanji of the patient's B case. Then, there is no relapse and Mr. B is not afflicted by many symptoms concerning gum disease, either.



[0032]

[Effect of the Invention] As mentioned above, disorders, such as gum disease and periodontoclasia, can treat easily and certainly by using the laser surgery equipment for dentistry of this invention, as explained in full detail.

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[Translation done.]